**CHEMISTRY 221** - **Dr. Powers**  **Problem Set -**  **FALL 2007**

**PRINT NAME** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Problem Set Lab Section**\_\_\_\_\_\_

**Due Date October 30, 2007**

**BE SURE YOU HAVE 6 DIFFERENT PAGES OF THIS PROBLEM SET**

***\*\*\*\*\*\*\*\*\*\*WRITE YOUR NAME ON EVERY PAGE\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\****

**SHOW ALL WORK - NO WORK - NO CREDIT**

**REPORT ALL ANSWERS WITH CORRECT LABELS AND SIGNIFICANT FIGURES**

• You may work with other students to complete this problem set.

• You may submit identical answers to the problem set if you work together in a group.

**REQUEST FOR REGRADE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date**

***PROBLEM SETS SUBMITTED FOR REGRADES SHOULD NOT LEAVE THE RESOURCE CENTER!***

Please regrade question because\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**\_\_\_\_\_\_ Check here if there is a mistake in addition.**

**You must sign your regrade request, or it will not be considered a valid request.**

I accept responsibility for all answers contained herein. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature

When submitting regrade request, **do not write on problem set pages.** Additional questions or comments are to be placed on a separate sheet of paper and turned in with your test. **Sign these as well.**

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| --- | --- | --- | --- |
| **Question No.** | **Possible Points** | **Points Earned** | **TA Initials** |
| **1** | **10** |  |  |
| **2** | **10** |  |  |
| **3** | **10** |  |  |
| **Total** | **30** |  |  |

1. **(10 points)** Iodate (IO3-) can be used to titrate an unknown Ca+2 solution by precipitating out CaIO3. The Ksp for this equilibrium is 7.1x10-7:

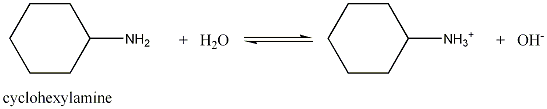


An electrode that measures pCa+2 is used to follow the above titration. A 0.1 M iodate solution is used to titrate a 50 ml solution of Ca+2 with a concentration of 0.0273 M? (ignore activity coefficients)

1. **(4 points)** Use Excel to plot a complete titration curve. The x-axis should be mL of added iodate from 0 to 50 mL. The y-axis is pCa+2.
2. (**2 point**) What volume of the iodate solution is required to reach the equivalence point?
3. **(2 points)** In general, what would happen to the titration curve in (a) if the ionic strength was held constant at 0.01 M (i.e. account for activity coefficients)?

1. **(2 points)** In general, what would happen to the titration curve in (a) if Ca+2 was replaced by Pb+2. The conditions are identical as in (a), but Pb+2 (Ksp is 3.69x10-13) is being titrated instead of Ca+2.

1. **(10 points)** A 0.0125 M solution of cyclohexylamine is made in pure water, where the following equilibrium exists:



* 1. **(5 points)** What is the pH of this solution if the pKa of ethylamine is 10.567?

b. **(5 points)** What is the pH if 3.33x10-3 M of CaCl2 is added to the solution?

1. **(10 points)** Given the following reactions:



*(i)*

*(ii)*

*(iii)*

* 1. **(2 points)** Write a charge balance equation for this system
  2. **(3 points)** Write a mass balance equation for this system

* 1. **(5 points)** Find the concentration of Ca+2 if the pH is fixed at 4.0 (ignore activity coefficients).